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ABSTRACT

A survey of several hundred German students led to two theses on school environment and learning. First, students find school buildings attractive only if they conform to certain features of the human sensory system such as balance. Second, students consider school buildings attractive and inviting only if their architectural message meets such social needs as warmth and openness. Humans perceive structure not only through conscious sight, but through dynamic perceptions of composition or pattern. This spontaneous dynamic apprehension process must take place before one can perceive a structure as "rigid," "dynamic," "living," or "dead." In addition, buildings always activate the human sense of balance, which is important in determining a person's relationship to space. Research shows that to regain their own sense of balance, students use eye movements to compensate for shapes that are displayed obliquely. Oblique structural angles upset the sense of balance and create a hostile architectural geometry. By contrast, balanced structures containing obliques and oblique counterangles are perceived as lively and exhilarating. Students who perceive antisocial messages in architecture may try to ignore, counter, or visually evade the structure. Thus, a school building can be attractive only if it provides various and stimulating structural shapes and colors, liberating and unconstrained configuration, and warmth and softness of colors and shapes. (JPT)

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HEALTHY SCHOOLS

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Christian Rittelmeyer

Healthy schools

My report originates from a 6-year research project at Göttingen University concerned with the effects of school architecture on pupils. The notion of the "healthy school" is therefore confined in the present case to the issues of school architecture and colour schemes. If, for instance, pupils assert that they feel hemmed in by certain spatial configurations, that a building gives them the sensation that they cannot breathe freely, or that a low-hung concrete ceiling creates a sense of oppression, they are referring to architectonic stress features which, by a further meaning of the term, may be interpreted as "illness-inducing".

What are the spatial arrangements and colour schemes in schools which are perceived by pupils as hostile, ugly or repellent, or alternatively as friendly, inviting and attractive? What are the conditions which determine whether a school building produces a positive or negative response?

In the course of our research project we questioned several hundred pupils from Lower Saxony and Baden-Württemberg, and in addition to this we used - probably for the first time in research on school architecture - measuring apparatus to determine the bodily responses produced by various types of school building. In view of the short time available, I should like to put to you the most important results of these investigations in the form of two theses:

1 School buildings can appear attractive, inviting and "healthy" to pupils only if they conform to certain features of the human sensory system, for instance, to the human sense of balance. This applies not only to school buildings, but to the response to architecture in general. We are therefore concerned with an anthropological and universal component of the impact of architecture.

2 School buildings can appear attractive, inviting and "healthy" to pupils only if their architectonic message satisfies certain fundamental social needs, for instance, only if they convey warmth and a lack of constriction. These qualitative social criteria may well not be universal, but may vary from one culture to another, and between one period and another.

I should now like to consider these two theses in somewhat greater detail. Turning initially to the first thesis, I should describe this as "anthropological", since it relates to the fundamental impact of architecture on the human physical constitution.

When we look at school buildings, e.g. façades or classrooms, we always see sharply only a small portion of our field of vision. This is due to the anatomical characteristics of the human eye, and we are therefore obliged to scan architecture with successive eye movements, without being aware of the fact. Depending on the geometry of the school, our own body unconsciously receives differing dynamic impressions. In other words: we perceive the structure not only through our sense of sight, but at the same time by characteristic and spontaneous eye movements which our own dynamic sense registers as different dynamic compositions or patterns. Depending on the architectonic shape concerned, this spontaneous dynamic apprehension process has to be performed before we are able to receive the impression of, say, a "rigid", "dynamic", "living" or "dead" structure. It is also true that buildings always activate our sense of balance, which is an important factor determining our relationship to space. This sense is irritated by oblique structures, but is set at rest by verticals and horizontals. If our sense of balance is excessively reassured, say by monotonous box structures, this produces an impression of architectonic rigidity, lifelessness and tedium. If our sense of balance is excessively irritated, the impression produced is one of anxiety, threat or chaos.

Our senses of movement and balance act together in determining our relationship to space. Certain apparatus can be used to reveal eye movements, and the sense of balance can be checked experimentally. Some examples of this may be cited.

1 Psychological tests carried out by other authors have shown that the sense of balance can be irritated in obliquely positioned fake rooms. The irritation is channelled through the sense of sight.

2 My own tests have shown that pupils do not suffer passively irritations of their sense of balance, but deal with them actively, though unconsciously. When triangles resting on their apex were exhibited, the eye-movement patterns of the children revealed an individually differentiated, active compensatory activity in response to these apparently unstable shapes. The pupils, aged 12 in this case, endeavoured to offset by compensatory visual movements the threat to their own sense of balance. Although there is no awareness of these compensatory movements, they lead in subjective apprehension to the impression of an interesting, activating figure. The greater the irritation of the sense of balance, the more unpleasant or threatening is this figure. While looking at geometrical oblique forms or apparently unstable configurations, children therefore endeavour to regain their own security of posture.

3 Compensatory movements of this kind are generally discernible in the observation of architectonic and geometrical objects. It is a fundamental principle that structural oblique angles invariably upset the sense of balance of the observer, i.e. the security of his relationship to space and the anthropological constants of upright motion and standing. Where the oblique angles of a building are prominent, a kind of visual battle with the structural environment takes place – a visual opposition to the architectonic form, which remains, however, unconscious, and manifests itself, as it were atmospherically, in the impression of a hostile architectural geometry.

4 By contrast, where there is a balanced composition of obliques and oblique counter-angles, this tends to be interpreted as lively, exhilarating and appealing. The example of the senses of movement and balance therefore illustrates how the human sensory system generates certain requirements to be met by school architecture. The implications for the response to architecture of the senses of touch and hearing, and of the functional senses of the living being, can be investigated in a similar manner.

However, a concern for the sensory qualities of school architecture does not, of itself, guarantee an appealing school building conducive to good health. For instance, pupils who are shown pictures of certain classrooms may exhibit a markedly negative response, describing the rooms as "cold", "lacking in character", "impersonal" or "uncongenial". These impressions are certainly not solely attributable to the sensory qualities of the rooms in the sense described above, but also to the fact that the architecture speaks a kind of language and carries an antisocial message. There are basically three different reactions to an antisocial message of this type. The pupils may "switch off" and try to "ignore" the architectonic attack (in our tests we noticed a reduction of pupil size in these cases). However, a disagreeable feeling persists. Alternatively, pupils may mount a counter-attack - either in the form of visual compensatory movements or by way of vandalism directed against the school. Or they practise visual evasive movements, for instance, by looking towards a window, because the wall opposite is felt to be hostile or cold. As already mentioned, this usually occurs unconsciously, and manifests itself only in mood, or in the experienced quality of life of the building. In this situation the building or the character of the room acts as a partner in dialogue with the pupils - a partner who is judged by the same criteria as are applied to the social behaviour of other human beings. And this brings me to the second thesis. This states that a school building can be attractive only if it possesses certain social qualities. What are the criteria which apply here?

We questioned several hundred pupils about their response to, and evaluation of, various school structures, using both real buildings and pictures. We established three consistent criteria which determine the appeal of the structural shapes and colour schemes of schools:

1 The rich variety and stimulating potential of structural shapes and colour schemes. This manifests itself, for instance, in façades divided up to give an impression of variety, in diverse (though not chaotic) colour schemes, and in the stimulation of the senses of movement and balance. The opposite pole is represented by monotonous, repetitious structural shapes.

2 A liberating and internally unconstrained building configuration. No oppressive ceilings on apparently unsubstantial pillars; no aggressive paintwork, but instead glazes conveying an idea of transparency; no excessive delimitations, e.g. in the form of windowless classrooms, but a pathway for the wandering glance; no oppressively representational paintings, but guides pointing the way to free space.

3 Warmth and softness of colours and shapes. Smooth transitions between architectonic elements, no discordant juxtaposition of colours or shapes; colours expressive of warmth; harmonisation between the ascents and descents, projections and recessing of architectural lines, and so on.

These three elements always act in the same way as gestures and expressions in social intercourse. Depending on their prominence and combination, pupils therefore talk about the awkwardness, inappropriateness, liveliness, rigidity, aggressiveness and lack of character of buildings. What they want is a kind of social being which acts as a partner in dialogue – a being which engages their interest and attention, but is at the same time uninhibiting and concerned, and radiates warmth and a spirit of

accommodation. How deep an impression is made on pupils by different forms of building, interpreted in terms of the latter's social demeanour, bearing and expression, is shown by the following experiment. We showed pupils aged 14 to 16 pictures of school buildings, and asked them to imagine that these buildings were capable of thinking and feeling like us. How would these buildings describe themselves?

Here are some of the written answers produced by the pupils:

Some answers relating to picture II.3: Rather overwhelmed; crushed down and carrying a heavy load ... I feel confined and constricted. – I feel like a gnome; small, compressed, friendly, not domineering but congenial. – A show-off, expansive, uninhibited, attractive, disordered. – I feel free, independent, dynamic, flashy. Boastful, something special, out-of-the-ordinary, splendid, protected, plenty of variation. – I feel very weighed down by the roof. The colours are unsuitable. – The roof looks much too heavy, the school looks like a weakling who is hardly able to raise his arms. Up to its roof, the school looks as if it could be hydraulically lowered into, and raised from, the ground. – Well, if I was the school, I should feel very demanding, because of my large size and the amount of space I took up. Or I should feel very low. Kind of squashed.

Some answers relating to picture II.2: The building feels large, strong and radiant; if it could move, it would be noisy, awkward and clumsy; like a robot; rigid. – The house is too stiff to be able to feel anything. No room for feelings. Feelings are walled up and painted over and can't get out. The flashy front of the building is a trick. It feels sick. Without make-up, it would look as if it had been dead for a long time. – Am I completely done for? If I had no colour, I should feel really low. – I feel lonely. In front of me there is nothing but the street. I wonder if anyone is ever pleased to come in. – I'm really on my own. I'm only noticed

because of my showy yellow paint. Otherwise, everyone would rather ignore me. – Clumsy, cold, revolting exterior, like a factory, but well made–up. I am impersonal like something between a fire station and a letter–box. Like Lego blocks fitted together without thought. – I am so ashamed of this loud colour. I am often mistaken for a post office. I am a really uncomfortable building. The pupils do not feel at all at ease inside me. This worries me deeply. I don't fit at all into my surroundings. I also feel too large, too immobile. I don't get enough air, and when the sun isn't shining, I am much too dark.

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